



ARCHIMEDES AT SYRACUSE: TWO NEW WITNESSES TO CASSIUS DIO'S *ROMAN HISTORY* 15 (TZETZES' *CARMINA ILIACA* AND *HYPOMNEMA IN S. LVCIAM*)*

ABSTRACT

Cassius Dio's fragmentary Roman History 15 contains an account of Archimedes' role in defending Syracuse during the Roman siege of 213–212 B.C., incorporating a legendary tale about a solar reflector Archimedes constructed to burn Roman warships, and including details of his death when the city fell. The textual basis of this famous episode depends on two derivative twelfth-century works: Zonaras' Epitome of Histories (9.4–5) and Tzetzes' Chiliades (2.35). After clarifying the present state of enquiry, this paper introduces two new witnesses, overlooked by editors of Dio and extensive scholarship on Archimedes, and assesses their value for reconstructing Dio's text. Comparative analysis of corresponding Dio-derived material in Tzetzes' Carmina Iliaca and Hypomnema in S. Luciam, especially verbal correspondences with Zonaras' Epitome, demonstrates that they are independent and, sometimes, superior witnesses to Dio's wording and content, reflecting Tzetzes' selective use of the Roman History in different verse and prose compositions over several decades. The study considers editorial implications for this section of Dio's work and general characteristics of Tzetzes' writings as repositories of testimonia and fragments.

Keywords: Cassius Dio; Roman historiography; Archimedes; Tzetzes; textual fragments

A remarkable florescence of interest in Cassius Dio has recently illuminated historiographic and literary dimensions of his *Roman History*.¹ Editorial questions, perhaps understandably, have attracted less attention. The basis of enquiry remains Boissevain's edition (1895–1901), magnificent but inevitably defined by contemporary knowledge and methodologies, particularly regarding fragmentary books transmitted via excerpts, epitomes and indirect traditions.² Concurrently, transformative scholarship on Byzantine literature, investigating texts as literary-cultural artefacts rather than mere

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¹ Among many recent volumes, cited below are: B. Simons, *Cassius Dio und die römische Republik* (Berlin, 2009); A.M. Kemezis, *Greek Narratives of the Roman Empire under the Severans. Cassius Dio, Philostratus and Herodian* (Cambridge, 2014); V. Fromentin, E. Bertrand, M. Coltelloni-Trannoy, M. Molin, G. Urso (edd.), *Cassius Dion: nouvelles lectures I–II* (Bordeaux, 2016); C. Burden-Strevens and M.O. Lindholmer (edd.), *Cassius Dio's Forgotten History of Early Rome: The Roman History, Books 1–21* (Leiden and Boston, 2019); C. Burden-Strevens, *Cassius Dio's Speeches and the Collapse of the Roman Republic: The Roman History, Books 3–56* (Leiden and Boston, 2020).

² U.P. Boissevain (ed.), *Cassii Dionis Cocceiani Historiarum Romanarum quae supersunt*, vols. 1–3 (Berlin, 1895–1901); index vols. 4 (1926), ed. H. Smilda; 5 (1931), ed. W. Nawijn (repr. Berlin, 1955; Hildesheim, 2002). The Collection Budé *Dion Cassius, Histoire romaine* (Paris, 1991–) to date comprises Books 36–42, 45–51, 53, 78–80.

vehicles of classical transmission, is shedding light on responses to Dio's narrative of the Roman past. Although never a school text, selection for Constantine VII's project of historical excerption (940s/950s) implies esteem or even quasi-'canonical' status.³ Particular interest emerges in the eleventh century with John Xiphilinus' partial *Epitome* (c.1071–1075), long utilized as a textual witness, now studied also in terms of compositional creativity.⁴ In the twelfth century, John Zonaras and John Tzetzes variously adapted Dio's work, including books since lost. While Zonaras' *Epitome of Histories* has rarely lacked scholarly attention, recent studies progress beyond *Quellenforschung* to sophisticated analyses of literary and stylistic priorities.⁵ Similarly, innovative engagement with Tzetzes' long-neglected writings, partly aligned with a fundamental rethinking of Byzantine poetry, is reappraising his aims, achievement and milieu, while affording opportunities to re-examine and discover testimonia and fragments embedded in his vast and diverse *œuvre*.⁶ Although Boissevain and his predecessors adduced Tzetzes' *Chiliades* (*Historiarum variarum Chiliades* or correctly *Histories*), by far his best-known work, as an indirect witness to Dio's *Roman History*, corresponding material in Tzetzes' *Carmina Iliaca* and *Hypomnema in S. Luciam* has been entirely overlooked. This paper introduces these two texts to classical researchers and assesses their value for reconstituting part of *Roman History* 15 that has not survived in a direct tradition, especially in light of verbal correspondences they exhibit with Zonaras' *Epitome*. This study will demonstrate that Tzetzes' scholia to his *Carmina Iliaca* and selected passages of the *Hypomnema* are independent and, sometimes, superior witnesses to Dio's wording and content, reflecting Tzetzes' differing use of Dio's work in distinct verse and prose projects over several decades.

These discoveries are all the more surprising as the events in question have been intensively studied: the siege of Syracuse by Roman forces under Marcus Claudius Marcellus in 213–212 B.C., and particularly Archimedes' involvement in defending his native city, the most famous historical episode in his biography.⁷ The siege has attracted inordinate interest largely owing to a fabulous tale of how Archimedes devised one or more mirrors to concentrate the sun's rays and set Roman vessels ablaze. Some brief remarks on the origin and evolution of this story are necessary to locate Dio's *Roman History* in this literary tradition.⁸ Unsurprisingly, near-contemporary sources

³ A. Németh, *The Excerpta Constantiniana and the Byzantine Appropriation of the Past* (Cambridge, 2018), 7–8, 69, 98, 271–2, 275–6. See 153–4, 160 for traces of Dio in tenth-century historiography.

⁴ C. Mallan, 'The style, method, and programme of Xiphilinus' *Epitome* of Cassius Dio's *Roman History*', *GRBS* 53 (2013), 610–44; B. Berbessou-Broustet, 'Xiphilinos, abrégiateur de Cassius Dio', in Fromentin et al. (n. 1), 81–94; M. Kruse, 'Xiphilinos' agency in the *Epitome* of Cassius Dio', *GRBS* 61 (2021), 193–223.

⁵ See nn. 29 and 58 below.

⁶ See most recently E.E. Prodi (ed.), *Τζετζικάϊ έρευνα* (Bologna 2022), with bibliography.

⁷ The classic study of Archimedes' life and writings remains E.J. Dijksterhuis, *Archimedes* (rev. ed. Princeton, 1987). Subsequent bibliography: M. Jaeger, *Archimedes and the Roman Imagination* (Ann Arbor, 2008); I. Schneider, *Archimedes: Ingenieur, Naturwissenschaftler, Mathematiker* (Munich, 2015²).

⁸ The bibliography on Archimedes' 'burning-mirror(s)' is vast and venerable, but often lacks dialogue between philological, historical and scientific scholarship. See selectively I. Schneider, 'Die Entstehung der Legende um die kriegstechnische Anwendung von Brennsiegeln bei Archimedes', *Technikgeschichte* 36 (1969), 1–11; D.L. Simms, 'Archimedes and the burning mirrors at Syracuse', *Technology and Culture* 18 (1977), 1–24; W. Knorr, 'The geometry of burning-mirrors in antiquity', *Isis* 74 (1983), 53–73, especially 53–5; R. Rashed, *Les catoptriciens grecs, I: Les miroirs ardents* (Paris, 2000), 317–20; P. Jal, 'Archimède et les miroirs ardents: quelques remarques', *RÉL* 85

and earlier derivative accounts, while reporting Archimedes' other defensive contraptions, do not mention solar reflection or any such naval disaster.⁹ The myth of Archimedes' burning-mirror (or mirrors) first emerges as incidental allusions in unconnected texts around the mid second century A.D., possibly indicating its genesis in Hellenic revivalist culture of the Second Sophistic.¹⁰ Against this recent background, Dio is the earliest historian known to have mentioned a burning-mirror at Syracuse. The legend essentially conflates unhistorical reports of technological inventions with actual scientific writings on catoptrics, a branch of geometrical optics concerned with reflective properties and applications of plane and concave/convex mirrors, including combustion.¹¹ Late antique authors investigated and embroidered this fictive episode.¹² The story drew renewed interest from eleventh- and twelfth-century Byzantine scholars, evincing broader intellectual currents in Constantinople, and continuing Archimedes' transformation from mathematician-engineer to semi-divine miracle-worker.¹³ Prominent in this tradition are Dio-derived accounts by Tzetzes and Zonaras.

CASSIUS DIO ON THE SIEGE OF SYRACUSE: TZETZES' *CHILIADES* AND ZONARAS' *EPITOME*

Scholarship has long reconstituted Dio's lost account of the siege of Syracuse (15 F57.35) from indirect textual traditions transmitted in Tzetzes' *Chiliades* and Zonaras' *Epitome*.¹⁴ Both authors cite Dio as a source for this event or constituent episodes. As each witness drew on Dio's work independently, their concurrence, in wording and/or substance, provides mutually corroborative evidence for the form and content of the original text.¹⁵ The testimonies of Tzetzes and Zonaras particularly coincide regarding two aspects: first, mechanical devices that Archimedes constructed to repel Marcellus' forces, including a solar reflector; second, how Archimedes met his death. Their texts are juxtaposed below with verbal parallels marked in bold.

(2007), 39–45; F. Acerbi, 'I geometri greci e gli specchi ustori', *Matematica, cultura e società* (2007–2008 [2011]), 187–230, especially 190–200.

⁹ Polyb. 8.3–7, 12, 37; Livy 24.33–5; Plut. *Vit. Marc.* 14.2–19.6; Sil. *Pun.* 14.292–340; Polyaeus, *Strat.* 8.11.1. See P. Schübeler, *De Syracusarum oppugnatione quaestiones criticae* (Geestemünde, 1910); F.W. Walbank, *A Historical Commentary on Polybius* (Oxford, 1967), 2.69–78.

¹⁰ Gal. *De temperamentis* 3.2; [Lucian], *Hippias* 2; Apul. *Apol.* 16.2–6.

¹¹ See recently Rashed (n. 8); F. Acerbi, 'The geometry of burning mirrors in Greek antiquity: analysis, heuristics, projections, lemmatic fragmentation', *Archive for History of Exact Sciences* 45 (2001), 471–97; Acerbi (n. 8).

¹² Olympiodorus, *In Platonis Gorgiam comm.* 38.2; Anthemius, *Περὶ παραδόξων μηχανημάτων* 2–5 (see below, pages 442–3), cf. Agathias, *Hist.* 5.7–8. See P. Rance, 'Tzetzes and the *mechanographoi*: the reception of late antique scientific texts in Byzantium', in Prodi (n. 6), 427–81, at 473–4.

¹³ Rance (n. 12), 466–74.

¹⁴ Tzetzes' *Chiliades* are cited from P.A.M. Leone (ed.), *Ioannis Tzetzae Historiae* (Naples, 1968¹; Galatina, 2007²). Older scholarship follows G. Kiessling (ed.), *Ioannis Tzetzae historiarum variarum Chiliades* (Leipzig, 1826; repr. Hildesheim, 1963), in which the verses are differently numbered. Zonaras' *Epitome* is cited from L. Dindorf (ed.), *Ioannis Zonarae Epitome historiarum* (Leipzig, 1868–1875) for Books 1–12; thereafter, T. Büttner-Wobst (ed.), *Ioannis Zonarae Epitomae historiarum libri XIII–XVIII* (CSHB 49/3) (Bonn, 1897).

¹⁵ Boissevain (n. 2), 1.232–5, reprised with English translation in E. Cary, *Dio's Roman History* (Cambridge, MA, and London, 1914–1927), 2.170–7.

Tzetzes, *Chil.* 2.35.112–31:

καὶ τοῦ Μαρκέλλου στρατηγοῦ ποτὲ δὲ τῶν Ῥωμαίων
τῆ Συρακούσῃ **κατὰ γῆν προσβάλλοντος καὶ πόντον**,
τινὰς μὲν πρῶτον **μηχαναῖς ἀνεῖλκυσε** ὀλκάδας,
καὶ πρὸς τὸ Συρακούσιον τεῖχος **μετεωρίσας** (115)
αὐτάνδρους πάλιν τῷ βυθῷ κατέπεμπε **ἄθροως**.

Μαρκέλλου δ' ἀποστήσαντος μικρὸν τι τὰς ὀλκάδας,
ὁ γέρων πάλιν ἅπαντας ποιεῖ Συρακουσίους
μετεωρίζει δύνασθαι **λίθους** ἀμαξιαίους,
καὶ τὸν καθένα πέμποντα βυθίζει τὰς ὀλκάδας· (120)

ὡς Μάρκελλος δ' ἀπέστησε βολὴν ἐκείνας τόξου,
ἐξάγωνόν **τι κάτοπτρον** ἐτέκνηεν ὁ γέρων·
ἀπὸ δὲ διαστήματος συμμέτρου τοῦ κατόπτρου
μικρὰ τοιαῦτα κάτοπτρα θεῖς τετραπλᾶ γωνίας
κινούμενα λεπίσι τε καὶ τισι γιγλυμίσι, (125)

μέσον ἐκεῖνο τέθεικεν **ἄκτινων τῶν ἡλίου**
μεσημβρινῆς καὶ θερινῆς καὶ χειμεριωτάτης.
ἀνακλωμένων δε λοιπὸν εἰς τοῦτο τῶν ἄκτινων
ἐξαφῆς ἦρθη φοβερὰ πυράδης ταῖς ὀλκάσι,
καὶ ταύτας ἀπετέφρωσεν ἐκ μήκους τοξοβόλου. (130)
οὕτω νικᾷ τὸν Μάρκελλον ταῖς μηχαναῖς ὁ γέρων.

And when Marcellus the Roman general was
attacking Syracuse by land and sea,
[Archimedes] at first hauled up some ships with machines,
and raising them to the height of the Syracusan wall,
suddenly sent them down into the depths, men and all.

Zonaras, *Epit.* 9.4 (2.262.25–263.8):

καὶ δι' ἐλαχίστου ἂν αὐτὰς ἐχειρώσατο, καὶ **κατὰ γῆν καὶ** κατὰ θάλασσαν ἅμα
προσβαλὸν τῷ τείχει, εἰ μὴ ὁ Ἀρχιμήδης **μηχαναῖς** ἐπὶ πλείστον αὐτοὺς
ἐποίησεν ἀντισχεῖν. καὶ **λίθους** γὰρ καὶ ὀπίτας μηχανήμασιν ἀπάρτων καθίει
τε ἐξαπιναιῶς αὐτοὺς καὶ ἀνέσπα δι' ὀλίγου. ταῖς τε ναυσὶ καὶ ταῖς
πυργοφόροις ἐτέρας ἐπιρρίπτων **ἀνεῖλκέ** τε αὐτὰς καὶ **μετεωρίζων ἄθροως**
ἠφίει, ὥστε ἐμπιπτούσας εἰς τὸ ὕδωρ ρύμη βαπτίζεσθαι. καὶ τέλος σύμπαν τὸ
ναυτικὸν τῶν Ῥωμαίων παραδόξως κατέπρησε. **κάτοπτρον** γὰρ **τι** πρὸς τὸν
ἥλιον ἀνατείνας τὴν τε **ἄκτινα** αὐτοῦ ἐς αὐτὸ εἰσεδέξατο καὶ τὸν ἀέρα ἀπ'
αὐτῆς τῆ πυκνότητι καὶ τῆ λειότητι τοῦ κατόπτρου πυρώσας φλόγα τε μεγάλην
ἐξέκαυσε καὶ πᾶσαν αὐτὴν ἐς τὰς ναῦς ὑπὸ τὴν τοῦ πυρὸς ὁδὸν ὀρμούσας
ἐνέβαλε καὶ πάσας κατέκαυσε.

And [Marcellus] would have seized [Syracuse] in the shortest time, attacking the walls
simultaneously both by land and by sea, had not Archimedes made it possible for them
to resist for a long time with his machines. For suspending both stones and soldiers on
machines, he suddenly let them down and quickly drew them up again, and launching
other [machines] on to the ships and tower-bearing vessels, he hauled them up and,

When Marcellus withdrew his ships a short distance, again the old man for all the Syracusans made it possible to raise up wagon-sized stones and, hurling them one by one, to sink the ships. Once Marcellus had withdrawn them a bowshot away, the old man constructed a kind of hexagonal mirror, and at an interval commensurate to the mirror's size he set small mirrors such as these, fourfold, at angles, moved both by plates and by certain small hinges, and he set this up amid the sun's rays at midday, whether in summer or midwinter. Afterwards, when the rays were reflected in this mirror, a terrifying fire was ignited on the ships and at the distance of a bowshot reduced them to ashes. Thus did the old man with his machines beat Marcellus.

Tzetz. *Chil.* 2.35.134–51:

οὔτος, κατὰ Διόδωρον, τῆς Συρακούσης ταύτης, προδότου πρὸς τὸν Μάρκελλον ἀθρόως γενομένης (135) εἶτε, κατὰ τὸν Δίωνα, Ῥωμαίοις πορθηθείσης,

Ἄρτέμιδι τῶν πολιτῶν τότε **παννυχιζόντων**, τοιοῦτοτρόπως τέθνηκεν ὑπὸ τινος Ῥωμαίου. ἦν κεκυφῶς **διάγραμμα** μηχανικόν **τι γράφων**, τὶς δὲ Ῥωμαῖος **ἐπιστάς** εἶλκεν αἰχμαλωτίζων. (140)

ὁ δὲ τοῦ διαγράμματος ὅλος ὑπάρχων τότε, τὶς ὁ καθέλκων οὐκ εἰδῶς, ἔλεγε πρὸς ἐκεῖνον· **“ἀπόστηθι, ὦ ἄνθρωπε,** τοῦ διαγράμματός μου”. ὡς δ’ εἶλκε τοῦτον συστραφεῖς καὶ γνοὺς Ῥωμαίων εἶναι, ἐβόα· **“τὶ μηχανήμα τὶς τῶν ἐμῶν μοι δότω”**. (145)

raising them aloft, suddenly released them so that they plummeted into the water with a crash and were submerged. Finally, in an incredible manner, he burned up the entire Roman fleet. For by tilting a kind of mirror toward the sun he concentrated the [sun’s] ray upon it, and owing to the thickness and smoothness of the mirror he ignited the air from this [ray] and kindled a great flame, the whole of which he directed upon the ships moored in the path of the fire and burned them all.

Zonaras, *Epit.* 9.5 (264.14–15, 264.27–265.2):

[ὁ Μάρκελλος] τηρήσας οὖν τοὺς Συρακουσίους **παννυχίδα** τῇ **Ἄρτέμιδι** ἄγοντας πανδημεί, ... τῶν λοιπῶν **τῆς Συρακούσης** ἐκράτησεν. ἐγκρατεῖς δὲ τούτων οἱ Ῥωμαῖοι γενόμενοι ἄλλους τε πολλοὺς καὶ τὸν Ἀρχιμήδην ἀπέκτειναν. **διάγραμμα** γάρ **τι διαγράφων**, καὶ ἀκούσας τοὺς πολεμίους ἐφίστασθαι, “πὰρ κεφαλάν” ἔφη “καὶ μὴ παρὰ γραμμάν.” **ἐπιστάντος** δὲ αὐτῷ πολεμίου βραχὺ τε ἐφρόντισε καὶ εἶπεν **“ἀπόστηθι, ἄνθρωπε,** ἀπὸ τῆς **γραμμῆς**” παρῶξυνέ τε αὐτὸν καὶ κατεκόπη.

ὁ δὲ Ῥωμαῖος πτοηθεὶς εὐθύς ἐκείνον κτείνει,
ἄνδρα σαθρὸν καὶ γέροντα δαιμόνιον τοῖς ἔργοις.
ἐθρήνησε δὲ Μάρκελλος τοῦτο μαθὼν εὐθέως,
λαμπρῶς τε τοῦτον ἔκρυπεν ἐν τάφοις τοῖς πατρώοις
σὺν τοῖς ἀρίστοις πολιτῶν καὶ τοῖς Ῥωμαίοις πᾶσι, (150)
τὸν δὲ φονέα τοῦ ἀνδρὸς οἶμαι πελέκει κτείνει.

When Syracuse itself was, according to Diodorus,
suddenly betrayed to Marcellus,
or, according to Dio, sacked by the Romans,
as its citizens celebrated an all-night festival to Artemis,
[Archimedes] was killed by a Roman in some such manner.
He was bent over, drawing some mechanical diagram;
a Roman, coming upon him, began dragging him off as a captive.
Being just then wholly absorbed with the diagram,
not knowing who was pulling at him, he said to him,
'Stand away, man, from my diagram.'
As he kept on pulling, turning and realising he was a Roman,
he cried out, 'Let someone give me one of my machines.'
The Roman, alarmed, straightaway killed him,
an infirm old man, miraculous for his works.
Marcellus, on learning this, straightaway mourned,
and buried him magnificently amid ancestral tombs,
with the noblest citizens and all the Romans,
but the man's murderer, I believe, he put to death with an axe.

[Marcellus], then, observing that the whole populace of Syracuse was celebrating an all-night festival to Artemis, ... conquered the remaining parts of Syracuse. And when the Romans had gained possession of these, they killed many people, including Archimedes. For while he was drawing some diagram, and hearing that the enemy were at hand, he exclaimed: '[May they strike] at my head and not at my figure'. When one of the enemy came upon him, he had but little concern and, by saying 'Stand away, man, from the drawing', he provoked him and was cut down.

Tzetzes more clearly signals the provenance of this material. In a protracted, multi-stage process from the mid 1150s, Tzetzes composed the *Chiliades* as a verse commentary to his self-edited letter collection.¹⁶ As throughout his *œuvre*, he asserts ‘scientific’ learning in frequent, if fanciful, references to celebrated ‘mechanical writers’ (μηχανογράφοι) or ‘mechanicians’ (μηχανικοί).¹⁷ The figure most often mentioned is Archimedes, whose achievements exercised a peculiar fascination, none more so than his alleged construction of burning-mirrors.¹⁸ Tzetzes also implies familiarity with Archimedes’ writings on catoptrics.¹⁹ Tzetzes devotes *Chil.* 2.35 to ‘Archimedes and some of his machines’ (Περὶ Αρχιμήδους καὶ τινῶν αὐτοῦ μηχανῶν), which primarily concerns his role in defending Syracuse (verses 112–31) and the circumstances of his death (134–51). In a concluding ‘source notice’ (152–9), Tzetzes adduces Dio and Diodorus as historical authorities for Archimedes’ life and works (152 ὁ Δίων καὶ Διόδωρος γράφει τὴν ἱστορίαν), alongside four named—and other unnamed—mathematical authors: Anthemius, Heron, Philo and Pappus (153–9). The relevant sections of Dio and Diodorus are lost. Tzetzes apparently consulted both historians, as he indicates that their accounts differed regarding how Syracuse fell: either, as Diodorus, by treachery (134–5) or, as Dio, by a nocturnal attack as the Syracusans celebrated a festival (136–7), though Tzetzes seemingly conflates two stages of a single narrative: the seizure of the outer city during an all-night festival of Artemis and the subsequent capture of the citadel of Achradina by treachery (Polyb. 8.37; Livy 25.24–31; Plut. *Vit. Marc.* 18). Moreover, throughout the *Chiliades*, Tzetzes frequently cites Dio and Diodorus, in combination or individually.²⁰ Comparison with other witnesses to Dio’s text, direct and indirect, suggests that Tzetzes had recent access to the *Roman History*, despite his claims to be writing ‘bookless’ (ἀβιβλης), a literary-rhetorical motif that simultaneously excuses inaccuracies and asserts prodigious mnemonic powers.²¹

Tzetzes drew the technical description of Archimedes’ complex hexagonal mirror (121–30) from a third source: a treatise on geometrical optics entitled *On Paradoxical Mechanisms* (Περὶ παραδόξων μηχανημάτων) by the sixth-century geometer, physicist and architect Anthemius of Tralles.²² Tzetzes seemingly

¹⁶ H. Spelthahn, *Studien zu den Chiliaden des Johannes Tzetzes* (Munich, 1904), 18–35; C. Wendel, ‘Tzetzes’, *RE* VII.A (1948), 1959–2011, at 1964–5, 1993–2000; Leone (n. 14), xxxix–lxiv; M. Grünbart, ‘Prosopographische Beiträge zum Briefcorpus des Ioannes Tzetzes’, *JÖB* 46 (1996), 175–226, at 217, 220.

¹⁷ T. Braccini, ‘Erudita invenzione: riflessioni sulla *Piccola grande Iliade* di Giovanni Tzetze’, *Incontri triestini di filologia classica* 9 (2009–2010), 153–73, at 157–60; M. Savio, *Screditare per valorizzare. Giovanni Tzetze, le sue fonti, i committenti e la concorrenza* (Rome, 2020), 64–8.

¹⁸ Archimedes and his inventions: *Chil.* 2.35, 12.457; Schol. *Ar. Nub.* 1024a (Holwerda 621.12–622.4). Archimedes’ burning-mirror(s): *Alleg. Il.* 5.10–15; *Chil.* 2.35.121–31, 156; 4.505–6; 12.457.967; *Hypomn. in S. Luciam* 3, 11. See Rance (n. 12), 431–52.

¹⁹ *Chil.* 2.35.156; 12.457.967; cf. 11.381.589. Collected ‘fragments’ of a *Catoptrica* ascribed to Archimedes: J.L. Heiberg, corr. E.S. Stamatis, *Archimedis Opera omnia cum commentariis Eutocii* (Stuttgart, 1972²), 2.549–51, F17–21. See Schneider (n. 7), 72–4; Acerbi (n. 8), 190–2.

²⁰ Dio and Diodorus: *Chil.* 1.27.703; 3.68.85, 69.102, 70.157; 4.132.280; 9.275.563–6; Dio: 2.34.87; 3.69.87, 111.880; 5.21.109; 6.60.522; Diodorus: 1.16.393, 22.596, 25.671, 27.703, 32.970; 2.32.18, 33.36, 38.562, 39.570; 3.91.389, 95.451, 113.942; 5.15.562; 6.53.465, 74.703; 8.252.978; 9.275.518; 12.399.181, 253, 258, 261. See C. Harder, *De Joannis Tzetzae historiarum fontibus quaestiones selectae* (Kiel, 1886), 58–9, 61–2; Schübeler (n. 9), xxv–xxvi; J.M. Moscovich, ‘Dio Cassius, Tzetzes, and the “Healthful Islands”’, *AHB* 8 (1994), 50–3.

²¹ Braccini (n. 17), 159–60; A. Pizzone, ‘The *Historiai* of John Tzetzes: a Byzantine “Book of Memory”’, *BMGS* 41 (2017), 182–207; Savio (n. 17), 12–13, 58–68; Rance (n. 12), 427–30.

²² The foundational exposition of Tzetzes’ use of Anthemius’ treatise was L. Dupuy, *Fragment d’un ouvrage grec d’Anthémios, sur les Paradoxes de Mécanique* (Paris, 1777), 28–36 (rev. repr.

acknowledges his indebtedness in the terminal source notice to *Chil.* 2.35: ‘many mention Archimedes, Anthemius the paradoxographer foremost’.²³ The surviving truncated text of *On Paradoxical Mechanisms* comprises three optical problems.²⁴ In the second, ‘How shall we cause combustion by means of the sun’s rays in a given position that is not less than a bowshot away?’, Anthemius adduces Archimedes’ feat as a historical precedent, before conjecturing Archimedes’ likely method and offering his own improvement. Tzetzes’ precise debt to Anthemius is of no immediate concern; it suffices to note that his verses (121–30) summarize Anthemius’ text, preserving words and phrases, though Tzetzes’ selection, abridgement and transpositions betray misunderstanding or carelessness.²⁵ In particular, Tzetzes failed to appreciate that the multi-unit hexagonal reflector is explicitly Anthemius’ alternative geometrical solution, which Tzetzes mistakenly transforms into Archimedes’ invention.²⁶ Of broader relevance for reconstructing Dio’s fragmentary work, Tzetzes’ effort to combine Dio and Anthemius offers a methodological template for studying other cases in which he sought to integrate historical narrative and technical exposition.²⁷

Zonaras’ testimony is more straightforward. Recent studies variously date the completion of his *Epitome* between c.1120 and c.1150.²⁸ Zonaras drew extensively and often exclusively on Dio’s first 21 books to construct his account of Roman history from Aeneas to 146 B.C., which editorial convention numbers *Epitome* 7–9. There is no evidence that Zonaras consulted Diodorus’ *Bibliotheca*.²⁹ Zonaras explains that, writing

MAIBL 42 [1786], 392–451, at 429–35). Nevertheless, later scholarship on Dio, though doubtful that these details of the mirror derived from his work, remained uncertain of the source: e.g. H. Haupt, ‘Neue Beiträge zu den fragmenten des Dio Cassius’, *Hermes* 14 (1879), 431–46, at 439; Boissevain (n. 2), 1.232–3 (app. crit.). Studies of Tzetzes’ sources also overlooked Anthemius’ text: e.g. Harder (n. 20), 72–3, 82, Schübeler (n. 9), xxviii; and it was omitted from Leone’s *apparatus fontium* (n. 14), 48. See G.L. Huxley, *Anthemius of Tralles: A Study in Later Greek Geometry* (Cambridge, MA, 1959), 4–5, 36–8; Rance (n. 12), 452–65.

²³ *Chil.* 2.35.153–4 καὶ σὺν αὐτοῖς [Δίων καὶ Διόδωρος] δε μέμνηνται πολλοὶ τοῦ Ἀρχιμήδους, | Ἀνθέμιος μὲν πρῶτιστον ὁ παραδοξογράφος. Cf. Schol. *Carm. Il.* 2.45b (166.7); *Alleg. Il.* 5.18; *Chil.* 12.457.969.

²⁴ The sole manuscript is Vaticanus gr. 218 (1r–2v). The commonly cited edition is J.L. Heiberg (ed.), *Mathematici graeci minores* (Copenhagen, 1927), 77–87. Two Arabic versions are variously preserved: edition with French transl. in Rashed (n. 8), 217–44, 286–321. M. Rashed re-edits the Greek text in Rashed (n. 8), 343–59, with emendations based on the Arabic tradition and/or re-examination of the Vaticanus under ultraviolet light. The English transl. in Huxley (n. 22), 6–19 is partly obsolete.

²⁵ Anthemius 2 tit., 3–4 (Heiberg 81.19–21, 83.27–84.26), with Rashed (n. 8), 356.

²⁶ Anthemius 3 (Heiberg 83.24–6). See Dupuy (n. 22), 31–3; Huxley (n. 22), 36–7; Rance (n. 12), 461–5.

²⁷ E.g. *Chil.* 2.34 (68–97), concerning Apollodorus’ Danubian bridge, combines material from Dio 68.13.1–6 (Xiph. S232.28–233.23) and a lost technological monograph *On Coastal Foundations* by an otherwise unattested Theophilus. See Rance (n. 12), 474–8.

²⁸ The *Epitome* terminates in 1118 and was used by Constantine Manasses in composing his *Chronological Synopsis*, seemingly before c.1152/3. Evidence, arguments and bibliography: T.M. Banchich and E.N. Lane, *The History of Zonaras. From Alexander Severus to the Death of Theodosius the Great* (London and New York, 2009), 2–7 (completed pre-1134); W. Treadgold, *The Middle Byzantine Historians* (Basingstoke and New York, 2013), 389–92, 399, 402 n. 67 (completed c.1145). L. Neville, *Guide to Byzantine Historical Writing* (Cambridge, 2018), 193–5 summarizes broader scholarly opinions.

²⁹ W.A. Schmidt, ‘Über die Quellen des Zonaras’, in Dindorf (n. 14), 6.i–ix, especially xxiv–xxxix; Haupt (n. 22), 438–9; T. Büttner-Wobst, ‘Die Abhängigkeit des Geschichtsschreibers Zonaras von den erhaltenen Quellen’, in A. Fleckeisen (ed.), *Commentationes Fleckeisenianae* (Leipzig, 1890), 121–70, especially 140–69; Boissevain (n. 2), 1.ii–vi, civ–cv; F. Millar, *A Study of Cassius Dio* (Oxford, 1964), 2–3, 195–203; K. Ziegler, ‘Zonaras’, *RE* X.A (1972), 718–32, at 725–9; Simons

in retirement in the island monastery of St Glyceria, he sometimes lacked access to necessary books, despite efforts to obtain them. Beyond conventional prefatory apologia, frequent reliance on a single-source narrative, interrupted by specific and substantial gaps, is consistent with a paucity of material.³⁰ Verbal and contentual correspondence with Tzetzes' verses corroborates that Zonaras (9.4) also based his account of Archimedes' defence of Syracuse on Dio's *Roman History* 15. Furthermore, in a later—often overlooked—passage of his *Epitome*, concerning an incendiary device used to save Constantinople from a naval assault in 515, Zonaras observes that Dio likewise recorded (ιστόρησε) Archimedes' use of a burning-mirror (or mirrors) to defend Syracuse.³¹

Accordingly, whereas Zonaras' *Epit.* 9.4–5 derives from Dio alone, Tzetzes' *Chil.* 2.35 cites Dio and Diodorus, neither extant, but also incorporates technical specifications from Anthemius. Up to and including Tzetzes' report of a mirror (verse 122), close parallelism with Zonaras' text suggests Tzetzes' exclusive dependence on Dio—or, at least, one struggles to discern any element that Tzetzes might have alternatively taken from Diodorus. Given evident misunderstanding in one strand of modern scholarship, it is important to clarify that Zonaras (κάτοπτρον γάρ τι) and Tzetzes (τι κάτοπτρον) record, in identical terms, 'a kind of mirror', providing independent corroborative testimony to the presence of this phrase in their common source, Dio, notwithstanding Tzetzes' decision to import additional details from Anthemius (verses 121–30).³² Only thereafter, from when the Romans enter Syracuse (verse 134), does Tzetzes expressly derive variant or supplementary content from Diodorus. Where Dio himself encountered information about a mirror can only be

(n. 1), 27–32; V. Fromentin, 'Zonaras abrégiateur de Cassius Dion: à la recherche de la préface perdue de l'*Histoire romaine*', *Erga-Logoi* 1 (2013), 23–39; M. Bellissime and B. Berbessou-Broustet, 'L'*Histoire romaine* de Zonaras', in Fromentin et al. (n. 1), 95–108; C. Mallan, 'The historian John Zonaras: some observations on his sources and methods', in O. Devillers and B.B. Sebastiani (ed.), *Sources et modèles des historiens anciens* (Bordeaux, 2018), 359–72.

³⁰ Zonar. pr. 2, 4 (1.5.12–17, 9.11–12); 9.31 (2.338.32–339.25), with Banchich and Lane (n. 28), 37–8. The library of this monastery, refounded in the 1090s, probably comprised core devotional texts, though Zonaras' private ownership or acquisition of secular historiography is reasonably inferred: C. Mango, 'Twelfth-century notices from Cod. Christ Church gr. 53', *JÖB* 42 (1992), 221–8; Treadgold (n. 28), 391–4.

³¹ Narrating Vitalian's revolt in 513–515, Zonar. 14.3.29–30 (Büttner-Wobst, 138.1–11) rehearses a largely unhistorical story about a philosopher named Proclus who defended Constantinople using burning-mirrors (or, in early versions, an inflammable chemical compound): κάτοπτρα γάρ ἄδεται χαλκεύσαι πυρφόρα ὁ Πρόκλος, καὶ ταῦτα ἐκ τοῦ τείχους τῶν πολεμίων νεῶν ἀπαιωρήσασα κατέναντι, τοῦτοις δὲ τῶν τοῦ ἡλίου ἀκτίνων προσβαλουσῶν πῦρ ἐκείθεν ἐκκεραυνοῦσθαι καταφλέγον τὸν νηϊτὴν τῶν ἐναντίων στρατὸν καὶ νῆας αὐτάς, ὃ πάλαι τὸν Ἀρχιμήδην ἐπινοῆσαι ὁ Δίων ἰστόρησε, τῶν Ῥωμαίων τότε πολιορκούντων Συράκουσαν, 'For the story goes that Proclus wrought burning-mirrors and suspended them from the wall opposite the enemy ships, and when the sun's rays fell upon them, fire burst forth and consumed the opposing naval force and the ships themselves; this, as Dio narrates, Archimedes long ago thought up, when the Romans were besieging Syracuse.' See J. Duffy, 'Proclus the philosopher and a weapon of mass destruction', in M. Grünbart (ed.), *Theatron: Rhetorische Kultur in Spätantike und Mittelalter* (Berlin, 2007), 1–11; Rance (n. 12), 467–72.

³² Haupt (n. 22), 438–9. Some specialists in the history of science misapprehend the significance of Dio's work and its textual relationships with Tzetzes and Zonaras, unaware of prior *Quellenforschung* and explicitly Zonar. *Epit.* 14.3.30 (see n. 31 above). Simms (n. 8), 7–10, 21, 24 needlessly doubts whether the lost section of Dio's *Roman History* mentioned a mirror. W.R. Knorr, 'Catoptrics', *OCD*³, 303 deems 'legends of Archimedes' use of great burning mirrors ... the product of Byzantine imaginations'. Recently, Acerbi (n. 8), 198–200 wishes to make Anthemius' treatise alone the common source for the κάτοπτρον recorded by Tzetzes and Zonaras.

conjectured, though, as previously observed, the story is unattested before the mid second century.³³ The protracted composition of Dio's *Roman History* is variously located between the 190s and the 230s.³⁴ As Dio apparently mentioned one burning-mirror, whereas previous and subsequent sources, if they indicate, specify several, he possibly drew on a variant tradition.³⁵ In contrast, it seems most unlikely that the lost section of Diodorus' *Bibliotheca* recorded a burning-mirror (or mirrors). In an extant earlier book (5.37.4), Diodorus promises discussion of Archimedes' inventions when the narrative reaches his era. However, writing over a three-decade period from the late 60s to late 30s B.C., Diodorus predates the earliest witnesses to this legend by two centuries, during which others who wrote at length about Archimedes' role in the siege, notably Livy and Plutarch, are silent on this matter.³⁶ Even so, almost the entire text of Tzetzes' *Chil.* 2.35 (verses 106–52 of 106–59) long ago became a canonical 'fragment' of Diodorus, though nothing connects Diodorus to verses 106–33, of which one-third (121–30) derive from Anthemius, while the rest coincide with Zonaras' Dio-derived *Epitome*. Tzetzes' *Chil.* 2.35 (106–52) thus leads a double life as a fragment of both Dio's *Roman History* 15 and Diodorus' *Bibliotheca* 26; this dual parentage is potentially justified only for verses 134–52.³⁷

TWO NEW WITNESSES: TZETZES' SCHOLIA TO THE *CARMINA ILIACA* AND THE *HYPOMNEMA IN S. LVCIAM*

Unnoticed by editors of Dio and students of the Archimedean tradition, two other compositions by Tzetzes contain material very similar to *Chil.* 2.35 and Zonaras' *Epit.* 9.4–5. This oversight is understandable: although critical texts of both exist, like much of his *œuvre*, they are obscurely published and virtually unknown outside 'Tzetzian' scholarship. This section introduces these works and examines their value as witnesses to the main episodes of Dio's text as preserved in this indirect tradition: Archimedes' defence of Syracuse and his death when the city fell.

³³ A. Klotz, 'Über die Stellung des Cassius Dio unter den Quellen zur Geschichte des zweiten punischen Krieges', *RhM* 85 (1936), 68–116 proposed lost historical works by Coelius Antipater and Valerius Antias as Dio's sources for the Second Punic War, though both predate the emergence of the legend by more than two centuries. See recently Simons (n. 1), 167–77; G. Urso, 'Cassio Dione e le fonti pre-liviane: una versione alternativa dei primi secoli di Roma', in Burden-Strevens and Lindholmer (n. 1), 53–75, especially 63–5.

³⁴ Kemezis (n. 1), 282–93 with bibliography.

³⁵ Anthemius 5 (Heiberg 85.7–9) καὶ γὰρ οἱ μεμνημένοι περὶ τῶν ὑπὸ Ἀρχιμήδους τοῦ θεοειοτάτου κατασκευασθέντων <ἐκκαύσαι> οὐ δι' ἐνὸς ἐμνημόνευσαν πυρίου ἀλλὰ διὰ πλείονων, 'for the authorities on what was contrived by the most godlike Archimedes recall that he effected ignition not by means of a single burning-mirror but by several'. Cf. Gal. *De temperamentis* 3.2 διὰ τῶν πυρῶν.

³⁶ See the early assessment of L.J. Heiberg, *Quaestiones Archimedeae* (Copenhagen, 1879), 39: 'sed putaverim eum [Tzetzem] ex illo [Diodoro] nihil nisi narrationem de morte Archimedis hausisse'; likewise, recently Jal (n. 8), 39–45. Plutarch's silence has particular significance, given his access to now-lost sources and familiarity with burning-mirrors used as temple gadgetry (*Vit. Num.* 9.6–7).

³⁷ Earlier editions of Diodorus admitted verses 134–52, where Diodorus is cited (134, 152); see first P. Wesseling (ed.), *Diodori Siculi Bibliotheca* (Amsterdam, 1746), 2.468. The editorial convention of quoting verses 106–52 as a 'fragment' originates in L. Dindorf (ed.), *Diodori Bibliotheca Historica* (Leipzig, 1828–1829²), II.2 205–6; thence (via Dindorf ed. 1866–1868⁴) F.R. Walton, *Diodorus of Sicily* (Cambridge, MA and London, 1933–1967), 11.192–6; L. Dindorf, corr. C.T. Fischer, *Diodorus, Bibliotheca Historica* 6 (Stuttgart, 1969), 359–61.

In several respects, the later of the two works is more easily integrated into current scholarship. As his only known endeavour in hagiography, Tzetzes wrote the *Hypomnema in S. Luciam*, a short prose ‘memorial’ to St Lucia of Syracuse, probably in 1154 or possibly 1158, in connection with one or other of two Sicilian embassies to Constantinople.³⁸ The text is thus contemporary with the *Chiliades*, though neither work derives from the other. In this inventive literary fantasy, Tzetzes incongruously makes St Lucia a proud descendant of Archimedes. She acclaims her forebear’s achievements, which become vehicles for strained Christianizing allegories. Her remarks on Archimedes’ defensive contraptions in two passages (3, 11) are essentially abridged prose versions of material versified in *Chil.* 2.35 (112–30), employing the same or similar vocabulary, and likewise combining Dio-derived historical description with technical specifications lifted from Anthemius’ treatise:³⁹

οὐδὲ **Μαρκέλλου** πολέμων τὰς συρραγὰς καὶ Ἀρχιμήδους ἐκείνου τὰς **μηχανάς**, αἷς τριῆρεις μὲν **αὐτανδροί** ἀνασπώμεναι **πρὸς τὸ τεῖχος τὸ Συρακούσιον**, εἶτα **μετέωροι** ἐκριπτούμεναι, αἱ δὲ **λίθοις** ἄνωθεν ἐκάστω ἀνδρὶ **ἀμαξιαίοις** βαλλόμεναι, αἱ δ’ ἔτι πορρώτερον ἐνορμίζουσαι ἀεροτόνοις σφενδόνας, αἱ δ’ ἐπὶ πλέον **ἀφεστηκυῖαι** ἐν **ἐξαγώνοις κατόπτροις** ἠλιακάς ἀντανακλάσασιν ἐκτυρούμεναι **αὐτανδροί τῷ βυθῷ** παρεπέμποντο.

Nor Marcellus’ clash of war and the machines of that Archimedes, by which triremes, men and all, are drawn up to the Syracusan wall, then, once aloft, cast forth, while some are hit from above by each man with wagon-sized stones, some moored still further off [hit] with air-driven catapults, others at a greater distance, set alight by solar reflections from hexagonal mirrors, are sent into the depths, men and all.

... ὃς **Μάρκελλον** διὰ τε γῆς καὶ θαλάσσης **τῇ Συρακούσῃ προσβάλλοντα** ταῖς **μηχαναῖς** ἀπεκρούσατο, πῆ μὲν **ὀλκάδας** ἐκείνου **πρὸς τὸ τεῖχος μετεωρότερον** ἀναρτῶν **μηχαναῖς**, καὶ οὕτω **βυθῷ** **παραπέμπον**, πῆ δὲ ἀκοντίζειν ποιῶν ἀνδρὰ ἕκαστον **λίθους ἀμαξιαίους**, καὶ ταύτας ὑποβρυχίους ποιῶν, ἐξορμησάσας δ’ αὐτὰς ἔτι πορρώτερον ταῖς ἀεροτόνοις τῶν μηχανῶν, εἰ δὲ καὶ **τόξου βολὴν ἀποστειναισάντων** τειχῶν πρὸς τὸ πέλαγος, ἐν **ἐξαγώνοις κατόπτροις** **τετραπλούμενοις** λαμπάδας **ἡλίου** δεχόμενος καὶ ταύτας φλέγων ἀντανακλάσασιν.

... [Archimedes] who, when Marcellus was attacking Syracuse by both land and sea, beat him off with machines, here suspending that man’s ships aloft above the wall from machines and thence sending them into the depths, there enabling each man to shoot wagon-sized stones and sinking them below the surface, while using the air-driven types of machine for those moored still further off, but, if they were also out to sea a bowshot from the walls, then by receiving the sun’s beams into fourfold hexagonal mirrors and setting them ablaze by reflections.

With regard to Archimedes’ death, however, Tzetzes’ *Hypomnema* (12) has greater critical value, as it exhibits verbal correspondences with Zonaras’ *Epitome* that are not found in Tzetzes’ *Chil.* 2.35. This concurrence and its implications will be examined below.

³⁸ Critical text, with Latin translation, in G. Sola, ‘Ioannis Tzetzis Hypomnema et S. Methodii patriarchae Canon in S. Luciam’, *Roma e l’Oriente* 14 (1917), 42–50; 15 (1918), 48–53; 16 (1918), 106–15; 17 (1919), 90–105. This supersedes A. Papadopoulos-Kerameus, *Varia graeca sacra. Сборник греческих неизданных богословских текстов IV–XV веков* (St Petersburg, 1909; repr. Leipzig, 1975), 80–97. Authorship and date: P.L.M. Leone, ‘Sull’*Hypomnema in S. Luciam* di Giovanni Tzetzes’, *Rivista di Bizantinistica* 1 (1991), 17–21.

³⁹ *Hypomn.* 3.14–21, 11.14–22; cf. 41–3, 48–50.

The testimony of the other new witness is more complicated and significant. Tzetzes obliquely touches on Archimedes in his earliest Homeric composition, conventionally titled *Carmina Iliaca* or Μικρομεγάλη Ἰλιάς.⁴⁰ Forced to eke a living by writing and teaching, in c.1133–1140 Tzetzes composed this condensed narration of the Trojan War in hexameters as a literary-educational ‘showpiece’ designed to secure pupils and/or patrons.⁴¹ An episode in *Il.* 5.1–8, where Athena invests Diomedes with a flame-like aura, prompts Tzetzes (2.44–8) to draw a contrastive analogy with historically distant events at Syracuse:

ὡς τῶν μαρνομένων Διομήδης ἔνθορε μέσσον,
 τεύχεσι λαμπόμενος πυρὶ τεχνήεντι ἀφλέκτω, (45)
 οὐχ οἷον φλογέεσκε Συρακοσίοιο κατόπτρου,
 τῷ ῥ’ Ἀρχιμήδης φλόγα εἴλκυσεν ἡελίοιο,
 πρήσε δὲ Μάρκου Μαρκέλλου νέας Αἰνεάδαο

As Diomedes leapt into the midst of those doing battle,
 from his arms shining with artificial fire without flame,
 not such as blazed from a Syracusan mirror,
 by which that Archimedes drew flame from the sun
 and burned ships of Aenean Marcus Marcellus

Tzetzes distinguishes the fiery glare of Diomedes’ equipment from the burning flame of Archimedes’ mirror. These verses attest Tzetzes’ interest in this topic perhaps two decades before he wrote his *Chiliades*.⁴² More intriguing than this brief allusion, however, are two scholia that Tzetzes wrote on his own verses (45–6). These scholia were published as early as 1770, and the first was re-edited in 1851, but both publications seemingly passed unnoticed by scholars of Archimedes. Even Leone’s critical edition (1995) remains a bibliographical rarity outside Italian libraries.⁴³ The first scholium elucidates πυρὶ τεχνήεντι (2.45) with a rationalizing exegesis of Diomedes’ divinely bestowed radiance: κάτοπτρον μηχανητὸν εἶχεν ἐπὶ τῆς ἀσπίδος ὁ Διομήδης δόκησιν πυρὸς ἀποστίλβον, ... πρὸς ἐκπτόησιν τῶν πολεμίων καθ’ ἡλιακῆς ἀκτίνος φερόμενον καὶ τῆ ἀντανακλάσει προσεπιτεῖνον τοῖς ἀπειροτέροις τὴν δόκησιν, ‘Diomedes had a mirror devised on his shield, shining forth an apparition

⁴⁰ P.A.M. Leone (ed.), *Ioannis Tzetzae Carmina Iliaca* (Catania, 1995); repr. (without scholia) with Italian translation in P.A.M. Leone (ed.), *Giovanni Tzetzes, La Leggenda Troiana (Carmina Iliaca)* (Lecce, 2015).

⁴¹ Braccini (n. 17); M. Cardin, ‘Teaching Homer through (annotated) poetry: John Tzetzes’ *Carmina Iliaca*’, in R. Simms (ed.), *Brill’s Companion to Prequels, Sequels, and Retellings of Classical Epic* (Leiden, 2018), 90–114; F. Conca, ‘L’esegesi di Tzetzes ai *Carmina Iliaca*, fra tradizione e innovazione’, *KOINΩNIA* 42 (2018), 75–99; B. van den Berg, ‘John Tzetzes as didactic poet and learned grammarian’, *DOP* 74 (2020), 285–302; U. Mondini, ‘Composing the Μικρομεγάλη Ἰλιάς. Macro- and microstructure of a Byzantine Homeric poem’, *BZ* 114 (2021), 325–54. The compositional *termini* c.1133–1140 can perhaps be narrowed to c.1138–1140: P.L.M. Leone, ‘I *Carmina Iliaca* di Giovanni Tzetze’, *Quaderni Catanesi di studi classici et medievali* 6 (1984), 377–405, at 377–8; Cardin (this note), 93–4.

⁴² Braccini (n. 17), 158–60; Rance (n. 12), 433–4.

⁴³ Schol. *Carm. Il.* 2.45b, 2.46a. G.B. Schirach (ed.), *Ioannis Tzetzae Carmina Iliaca* (Halle, 1770), 45–8 published corrupted texts of both scholia. I. Bekker (ed.), *Ioannis Tzetzae Antehomerica, Homerica et Posthomerica* (Berlin, 1816) omitted all scholia. B. ten Brink, ‘Hipponactea’, *Philologus* 6 (1851), 35–80, 215–27, at 225–6 reprinted Schirach’s text of schol. 2.45b with conjectural emendations. Both scholia are re-edited in Leone (n. 40 [1995]), 165.17–166.10, 166.13–169.13. Tzetzes’ scholia are currently omitted from the *TLG*, which cites a revision of Bekker’s edition in F.S. Lehrs and F. Dübner (edd.), *Hesiodi Carmina* (Paris, 1840).

of fire, ... causing alarm among the enemy through a solar ray and, by reflection, intensifying the apparition for the more inexperienced'. Typical of his claims to scientific authority, Tzetzes appends a fictitious catalogue of ancient 'mechanicians' (μηχανικοί) who recommend this combat application of mirrors in optical/catoptical writings.⁴⁴ Around the early/mid 1140s, Tzetzes reprised this techno-allegorical interpretation of supernatural brilliance at *Il.* 5.1–8 in his *Allegories of the Iliad*. Now in verse, he again differentiates Diomedes' 'flameless fire' (πῦρ ἀφλεγές) from Archimedes' 'burning mirror' (καυστικὸν κάτοπτρον), substantiating his scientific knowledge with a similar but augmented list of 'mechanical writers' (μηχανογράφοι).⁴⁵

Tzetzes' second and much longer scholium to Συρακοσίω κατόπτρου (2.46a) is more complex and intriguing.⁴⁶ Its structure comprises four basic units, defined by content and/or source(s). The first three broadly mirror the sequence of *Chil.* 2.35, though each text contains material not found in the other. The first section concerns Archimedes' defensive devices, including a burning-mirror. Again Tzetzes combines Dio's historical narrative with Anthemius' technical exposition (166.13–168.2 = *Chil.* 2.35.106–31). The second briefly digresses on Archimedes' extraordinary accomplishments with pulleys, as reported in multiple sources drawing on variant traditions (168.2–6 = *Chil.* 2.35.132–3).⁴⁷ The third returns to the siege, particularly Archimedes' death, at least partly based on Dio, as indirectly witnessed by Zonaras and Tzetzes' *Chiliades* (168.6–18 = *Chil.* 2.35.133–51). The fourth quotes a tetrastichic inscription on a statue of Marcellus, as recorded by Plutarch (168.18–169.6 = *Plut. Vit. Marc.* 30.5).⁴⁸ It will be demonstrated below that this scholium draws independently on the same source as Zonaras' *Epit.* 9.4–5 and Tzetzes' *Chil.* 2.35.106–31, namely Dio's *Roman History*. To this end, the first and third sections are quoted here in full:⁴⁹

Συρακοσίω κατόπτρου· ὁ Ἀρχιμήδης οὗτος ἐπὶ Ἰέρωνος ἦν καὶ Πυθαγόρου, γέρων γεωμέτρης μηχανικὸς Συρακοῦσιος τὴν ἡλικίαν ἐγγὺς ὀγδοήκοντα ἑτῶν, ὃς μυρία μὲν πεποιήκεν ἕτερα, ἀλλὰ καὶ Μάρκελλον τὸν στρατηγὸν τῶν Ῥωμαίων τῇ Συρακούσῃ πολέμῳ βαρεῖ κατὰ γῆς καὶ θαλάσσης ἐπιτεθέντα μεγάλοις συνέθραυσε μηχανήμασι. πρῶτα μὲν γὰρ μηχανὰς ἐκ τοῦ τείχους καθίεις, αὐτάνδρους ἀνέσπα τὰς τρήρεις ἐκείνου καὶ μεταωρίζων εἰς ὕψος καὶ κατασπῶν εἰς τὴν θάλασσαν ὑποβρυχίους ἐποίει. τοῦ Μαρκέλλου δὲ τὰς λοιπὰς ὀλκάδας πορρώτερον τοῦ τείχους πελαγιώτερον καθελκύσαντος, μηχανήμασι πάλιν ὁ αὐτὸς Ἀρχιμήδης τὸν καθένα τῶν Συρακοῦσιῶν ἐποίει λίθους σφενδονᾶν ἀμαξήρεις καὶ πάλιν τὰς ὀλκάδας βυθίζειν. ἀπογνοὺς δὲ ὁ Μάρκελλος τὸν τείχους ἐπίπλου τὸς βολὴν πόρρωθεν εἴλκυσε ταύτας· ὁ δὲ κάτοπτρον ἐξάγων ποιήσας ποδιαῖον τὸ μέγεθος καὶ ἀνατείνας αὐτό, ὡς ἀπέχειν ἐξ ἴσου διαστήματος μεσημβρινῆς, θερινῆς καὶ χειμερινῆς ἡλίου ἀκτίνος καὶ θείας παρ' ἐκάστην

⁴⁴ Schol. *Carm. Il.* 2.45b (165.17–166.10). See Rance (n. 12), 434–5.

⁴⁵ *Alleg. Il.* 5.1–24 (Boissonade 105–6/Matranga 1.66–7). Date: A. Rhoby, 'Ioannes Tzetzes als Auftragsdichter', *Graeco-Latina Brunensia* 15 (2010), 155–70, at 159–65. Cf. Eust. *Il.* 5.4–7 (van der Valk 2.5.1–7). See Rance (n. 12), 435–9.

⁴⁶ Schol. *Carm. Il.* 2.46a (166.13–169.6). Schol. 2.46b (169.7–13) is a later truncated paraphrase; see Leone's editorial remarks at viii–ix, xxviii–xxix.

⁴⁷ Schol. *Carm. Il.* 2.46a (168.2–6) concerns the *chariston* (χαριστίων), here identified as a triple pulley (τρίσπαστον), and Archimedes' boast that, given a place to stand, he could move the earth. The parallel section at *Chil.* 2.35.132–3 is briefer. Cf. Schol. *Ar. Nub.* 1024a (Holwerda 621.20–622.4); *Chil.* 2.35.110–11; 3.66.63–5; *Hypomn.* 11.61–4. See Dijksterhuis (n. 7), 14–18; Jaeger (n. 7), 103–9. Plutarch (*Vit. Marc.* 14.4–9, 17.3–7) likewise digresses from his siege narrative to discuss Archimedes' mechanical achievements, but does not mention these details.

⁴⁸ T. Preger, *Inscriptiones graecae metricae* (Leipzig, 1891), 131–2, no. 168, citing Tzetzes' scholium from MS Augustanus 354, 47v (now Monacensis gr. 546), seemingly unaware of Schirach's 1770 edition (n. 43).

⁴⁹ Schol. *Carm. Il.* 2.46a (166.13–168.2, 168.6–18).

ἐκείνου γωνίαν ἕτερα τέτταρα μικρότερα κάτοπτρα, τῇ ἀνακλάσει τῆς ἀκτίνος τὰς ὀλκάδας ἐνέπρησε τοσοῦτον ἀφραστηκυίας. ὁ δὲ Μάρκελλος ἐπὶ τοῖς συμβάσι δεινοπαθῶν ἔλεγεν· 'εἰ δυνατὸν ἐξεγένετο πάσαν τὴν περὶ τὸν κόσμον ὑπάρχουσαν στρατιάν εἰς ταῦτὸν συναχθῆναι καὶ τῷ ἐμῷ στρατεύματι ἀντιτάξασθαι, ἔσθησα ἄν, εὖ οἶδα, νικητικώτατον τρόπαιον. νῦν δέ—ἀβάλε μοι τῆς αἰσχύνης—ἐν τῷ δαμιόνιον γηρανδρῶριον γενναίως καὶ ἀσυγκρίτως οὕτω καταγωνίζεται, ὡς μὴδὲ τὸ σύνολον ἀνταίρειν τολμῶν.'

... this Archimedes lived at the time of Hieron and Pythagoras, an aged geometer [and] mechanician of Syracuse, close to eighty years of age, who had made countless other things, but also used great machines to crush Marcellus, the Roman general, as he beset Syracuse with heavy fighting on land and sea. For first, letting down machines from the wall, he drew up [Marcellus'] triremes, men and all, and raising them aloft to a height and dragging them down into the sea, he sank them below the surface. When Marcellus pulled back the rest of his ships from the wall further out to sea, again with machines the same Archimedes made it possible for each one of the Syracusans to sling wagon-sized stones and again to sink the ships. Giving up on sailing against the wall, Marcellus pulled them back as far as a bowshot, but [Archimedes], having made a hexagonal mirror, one foot in dimension, and having tilted it so that it was at an equal distance from the midday rays of the sun, in summer or midwinter, and having set at each angle of that [mirror] four other smaller mirrors, by the reflection of the rays set the ships on fire when they were so far away. Bemoaning these events, Marcellus said: 'if it were possible that all the forces existing around the world were gathered in this place and arrayed opposite my army, I would have raised, I know well, a trophy to a very great victory. But now—oh, the shame of it—one withered old man with miraculous power so nobly and incomparably resists, that the entire [army] does not dare oppose [him].'

τελευτᾷ ὁ γέρον ὠδὲ πως. ἀλούσης τῆς Συρακούσης ὑπὸ Μαρκέλλου ἢ παννυχιζόντων Συρακουσίων Ἀρτέμιδι ἢ προδεδομένης παρὰ τινων ἐπέστη τῷ γεωμέτρῳ Ῥωμαῖος ξιφῆρης μηχανικόν τι διάγραμμα γράφοντι καὶ καθεῖλκεν αὐτόν· ὁ δὲ 'ἀπόστηθι, ἄνθρωπε, τῆς γραμμῆς' αὐτῷ ἔλεγεν. ὡς δ' ὁ Ῥωμαῖος ἐπέκειτο καὶ σφοδρότερος εἶλκεν αὐτόν, ὁ Ἀρχιμήδης στραφεῖς καὶ συνεις τὸ πραχθὲν ἔβόα· 'δὴ τῶ μοί τις τι τῶν ἐμῶν μηχανῶν'. καὶ περιδεῖς γεγονῶς ὁ Ῥωμαῖος ἀνεῖλεν αὐτόν. ὁ δὲ βασιλεὺς Ῥωμαίων ὁ Μάρκελλος ἐθρήνησε τοῦτο ἀκηκόως καίπερ πολέμιος ὢν καὶ τὴν κόμην ἐσπάραζεν ἐπὶ τούτῳ καὶ πολέμιῳ πεφυκῶτι καὶ γέροντι καὶ μεγαλοπρεπῶς αὐτόν μετὰ πάντων Ῥωμαίων καὶ ἀρίστων Συρακουσίων ἐνεταφίασε, τὸν δὲ τούτου οἶμα φονεᾶ πελέκει κατέκρινεν.

The old man met his end in this way. When Syracuse was taken by Marcellus, either while the Syracusans were celebrating an all-night festival of Artemis or because betrayed by certain people, a Roman swordsman came upon the geometer as he was drawing some mechanical diagram and began to drag him away, but [Archimedes] said to him 'Stand away, man, from my drawing'. As the Roman persisted and dragged him more vigorously, Archimedes, having turned around and perceived what was happening, cried out 'Let someone give me one of my machines'. And becoming fearful, the Roman slew him. The king of the Romans, Marcellus, mourned on hearing this, even though he was an enemy, and tore his hair for this person who had been both an enemy and an old man, and with all the Romans and noblest Syracusans he gave him a magnificent burial, while his murderer, I believe, he condemned to the axe.

Before proceeding to a closer textual examination, a question of dating must be addressed. While Tzetzes' composition of the *Carmina Iliaca* is securely anchored in the 1130s, the date of his scholia has not been demonstrated. Recent studies assume or imply the contemporaneity and integrity of Tzetzes' verses and scholia, but it remains uncertain whether this erudite 'showpiece', combining virtuoso hexametric display and sample teaching text, was originally furnished with a full pedagogic apparatus or later modified in light of classroom practice.⁵⁰ In particular cases, evidence permits tentative

⁵⁰ E.g. Cardin (n. 41), 93 n. 11, 101–5; Mondini (n. 41), 330–1. Variations in the manuscript transmission of the scholia do not assist in resolving this issue: Leone (n. 40 [1995]), xii–xxxii.

inferences about relative chronology. Arguably in favour of an early dating of scholium 2.46a is the high incidence of errors or conflicting details, all of which were omitted from or corrected in *Chil.* 2.35, and are thus explicable as mistakes of a younger Tzetzes.⁵¹ Elsewhere, at least, Tzetzes seized opportunities to correct errors committed in his youth.⁵² If this interpretation is correct, Tzetzes' interest in this subject and access to relevant historical and technical sources go back to his earliest writings. This chronology would also mean that scholium 2.46a was written around the same time or possibly before Zonaras completed his *Epitome*, while Tzetzes would not begin composing his *Chiliades* and *Hypomnema* for another fifteen to twenty years.⁵³

Whenever Tzetzes wrote scholium 2.46a, comparative analysis indicates that he did not merely rework the same material found in *Chil.* 2.35 but consulted Dio's text directly; that is to say, scholium 2.46a and the *Chiliades* are discrete projects. Hitherto scholarship has recognized Tzetzes' *Chiliades* and Zonaras' *Epitome* as independent witnesses to Dio's account of the siege of Syracuse. When scholium 2.46a is adduced as a third independent witness, the prospect of constituting Dio's text is correspondingly enhanced. Furthermore, in Tzetzes' *Chiliades*, composed in iambic decapentasyllabic verse, vocabulary and syntax are variously affected by metrical considerations that do not constrain the prose of his scholium. Most importantly, although linguistic parallels between Tzetzes' two texts, even if separated by two decades, may be explained as a consequence of their common authorship, verbal correspondence between Tzetzes' scholium and Zonaras alone must originate in their common source. This is apparent in the first section of the scholium, concerning Archimedes' military devices:

Zonaras, *Epit.* 9.4 (2.262.25–263.4):

... καὶ κατὰ γῆν καὶ κατὰ θάλασσαν ἅμα προσβαλὼν τὸ τεῖχει, εἰ μὴ ὁ Ἀρχιμήδης μηχαναῖς ἐπὶ πλείστον αὐτοῦς ἐποίησεν ἀντισχεῖν. καὶ λίθους γὰρ καὶ ὀπλίτας μηχανήμασιν ἀπαρτῶν καθίει τε ἐξαπναιῶς αὐτοῦς καὶ ἀνέσπα δι' ὀλίγου. ταῖς τε ναυσὶ καὶ ταῖς πυργοφόροις ἐτέρας ἐπιρρίπτων ἀνεϊκκῆ τε αὐτάς καὶ μετεωρίζων ἀβρόως ἤφρει, ὥστε ἐμπιπτούσας εἰς τὸ ὕδωρ ρύμη βαπτίζεσθαι. καὶ τέλος σῆματι τὸ ναυτικὸν τῶν Ῥωμαίων παραδόξως κατέπρησε. κάτοπτρον γὰρ τι πρὸς τὸν ἥλιον ἀνατείνας τὴν τε ἀκτίνα αὐτοῦ ἐς αὐτὸ εἰσεδέξατο ...

Tzetzes, schol. *Carm. Il.* 2.46a (166.16–167.11):

... καὶ Μάρκελλον ... πολέμῳ βαρεῖ κατὰ γῆς καὶ θαλάσσης ἐπιτεθέντα μεγάλους συνέθραυσε μηχανήμασι. πρῶτα μὲν γὰρ μηχανὰς ἐκ τοῦ τεύχους καθίει, αὐτάνδρους ἀνέσπα τὰς τριήρεις ἐκείνου καὶ μετεωρίζων εἰς ὕψος καὶ κατασπῶν εἰς τὴν θάλασσαν ὑποβρυχίους ἐποιεῖ. ... μηχανήμασι πάλιν ὁ αὐτὸς Ἀρχιμήδης τὸν καθένα τῶν Συρακουσίων ἐποιεῖ λίθους σφενδονῶν ἀμαζήρειας καὶ πάλιν τὰς ὀλκάδας βυθίζειν. ... ὁ δὲ κάτοπτρον ... καὶ ἀνατείνας αὐτὸ, ὡς ἀπέχειν ἐξ ἴσου διαστήματος μεσημβρινῆς, θερινῆς καὶ χειμερινῆς ἡλίου ἀκτίνας ...

The independent descent of scholium 2.46a from Dio's text is best illustrated by the sequence καθίεις, αὐτάνδρους ἀνέσπα, where καθίει and ἀνέσπα are found

⁵¹ The chronological reference ἐπὶ Ἱέρωνος ἦν καὶ Πυθαγόρου (166.13–14) is baffling: while Archimedes lived under Hieron II (reigned 269–215 B.C.), no Pythagoras figures in contemporary Syracusan history. If the famous philosopher is meant, Tzetzes has blundered. Archimedes' near 80-year lifespan (166.15) conflicts with the implication of *Chil.* 2.35.108 that he died aged 75, though Tzetzes' source in either case is unknown and he may merely elaborate ancient indications of Archimedes' senectitude (see n. 62 below). The foot-wide dimension (ποδιαῖον τὸ μέγεθος) of the hexagonal mirror (167.9) finds no parallel in *Chil.* 2.35 nor in Tzetzes' source, Anthemius. Obviously, Marcellus was not ὁ βασιλεὺς Ῥωμαίων (168.14).

⁵² E.g. Tzet. *Prolog. Comm.* 1.144–7, 2.34–9 (Koster) explicitly corrects an error in *Exeg. Il.* (Papathomopoulos 68.12–69.4). See H. Giske, *De Ioannis Tetztae scriptis ac vita* (Rostock, 1881), 61–3; Wendel (n. 16), 1966–7, 1974–7.

⁵³ In this chronological scheme, a dating of Zonaras' *Epitome* to the mid/late 1140s (see n. 28 above) would make Tzetzes' scholium 2.46a the earlier text.

sequentially in Zonar. 9.4 but not in Tzetzes' *Chil.* 2.35, while ἀντάνδρους is found in *Chil.* 2.35 (116) but not in Zonar. 9.4. Within this intricate intertextual pattern, while bilateral correspondence between Tzetzes' two works could—but does not necessarily—indicate that he found ἀντάνδρους in Dio, agreement between Tzetzes' scholium and Zonaras guarantees the presence of καθειί(ς) and ὀνέσπα in Dio's text.⁵⁴ Significantly, the phrase ἀνατεινὰς αὐτό in Tzetzes' scholium finds a parallel in Zonar. 9.4 (πρὸς τὸν ἕλιον ἀνατεινὰς) but not in Tzetzes' *Chil.* 2.35, indicating Dio's use of this participle in reference to Archimedes' mirror. This concurrence again underlines the presence of the κάτοπτρον in Dio's account and provides a rare splinter of verbal certainty at precisely the point where the testimony of Zonaras and Tzetzes' *Chiliades* diverges, owing to Tzetzes' insertion of technical content from Anthemius' treatise. Incidentally, where the wording of *Chil.* 2.35 has proved obscure, scholium 2.46a can now also clarify how Tzetzes (mis)understood Anthemius' specifications for a complex reflector.⁵⁵

Following this description of Archimedes' contraptions, scholium 2.46a records Marcellus' reaction in direct speech (167.13–168.2 ὁ δὲ Μάρκελλος ἐπὶ τοῖς συμβάσι δεινοπαθῶν ἔλεγεν 'εἰ δυνατὸν ... τολμᾶν'), in which he bemoans his forces' defeat by 'one withered old man with miraculous power' (ἐν τι δαμόνιον γηρανδρόριον). Unlike preceding material, the provenance of this quotation cannot be traced. No corresponding speech episode occurs in Tzetzes' *Chiliades* and Zonaras' *Epitome*, though this absence is not crucial. Ordinarily, Tzetzes' fifteen-syllable verses accommodate only short declarations, apophthegms or *bons mots*.⁵⁶ Zonaras, in accordance with generic convention and authorial taste, generally omits or condenses extended speech episodes in his sources.⁵⁷ Comparative analysis of Zonaras' text and Dio's extant books or excerpts reveals that he pursued several abridging methodologies, either excluding the content of speeches, debates and dialogues entirely or, where they serve causal or explicative functions, summarizing selected arguments or drastically reducing the general tenor to a terse résumé. However, even when extended direct discourse is completely excised, Zonaras often retains its surrounding narrative framework by recording that a speech occurred (typically using λέγειν, διαλέγεσθαι, δημηγορεῖν) and by acknowledging its performative impact on the audience and the course of events. Zonaras thus 'de-rhetorizes' Dio's text, transforming direct discourse into descriptive report.⁵⁸ In

⁵⁴ A similar pattern of bilateral correspondences is apparent in Tzetz. *Hypomn.* 3.16 τριήρεις μὲν ἀντάνδροι ἀνασπόμενοι, combining the passive participial ἀνασπῶ and ἀντάνδρος. There are other inexact parallels between Tzetzes' *Hypomnema* and Zonaras' *Epitome*: e.g. *Hypomn.* 3.20 ἐκπυρούμενοι, cf. Zonar. 9.4 (263.6) πυρώσας; *Hypomn.* 11.17 ἀναρτῶν μηχαναῖς, cf. Zonar. 9.4 (262.29) μηχανήμασιν ἀπαρτῶν.

⁵⁵ Rance (n. 12), 461–5.

⁵⁶ E.g. *Chil.* 2.35.132–3, quoting Archimedes on moving the earth (see n. 47 above); 2.35.142–5, Archimedes' final utterances (see below). Exceptional cases of extended direct discourse: e.g. *Chil.* 6.39.214–24, stichomythic dialogue between Porsenna and Gaius Mucius, which Boissevain (n. 2), 1.39 derived from Cass. Dio 4.

⁵⁷ Zonar. pr. 1 (1.3.10–20) criticizes lengthy orations in previous histories.

⁵⁸ V. Fromentin, 'La fiabilité de Zonaras dans les deux premières décades de l'*Histoire romaine* de Cassius Dion: le cas des discours', in Burden-Strevens and Lindholmer (n. 1), 27–52 provides nuanced analysis. See also J. Rich, 'Speech in Cassius Dio's *Roman History*, Books 1–35', in Burden-Strevens and Lindholmer (n. 1), 217–84, especially 228–30, 273–4; M. Bellissime, 'Zonaras, l'auteur derrière l'épitomateur', in I. Boehm and D. Vallat (edd.), *Epitome: abrégé les textes antiques* (Lyon, 2020), 107–17; broader observations in Burden-Strevens (n. 1).

contrast to extended orations, Zonaras more often reproduces short direct-speech episodes such as pithy utterances and ripostes essential to a story, which, it seems, were frequent across Dio's work.⁵⁹ The direct speech in Tzetzes' scholium may not meet these criteria, inasmuch as Marcellus' frustrated outburst is not deliberative, epideictic or hortatory oratory, but rhetorical interjection without historical consequence. However, with some imagination, one might discern a parallel narrative development in Zonaras' text at this point, immediately following the destruction of the Roman fleet: ἀπογνοῦς οὖν ὁ Μάρκελλος τὴν πόλιν αἰρήσειν διὰ τὸ τοῦ Ἀρχιμήδους εὐμήχανον, 'Marcellus, then, despairing of taking the city on account of Archimedes' mechanical ingenuity ...'.⁶⁰ Zonaras' wording does not signal an excised speech episode using his usual verbal markers, but his report of Marcellus' *aporia* precisely coincides with the positioning of the direct speech in Tzetzes' scholium and encapsulates its content and sentiment in a manner consistent with Zonaras' method of abridgement. Curiously, the closest extant counterpart occurs in Plutarch's *Life of Marcellus*: directly after Archimedes' machines shatter the Roman naval assault (15.1–16.2), Plutarch likewise quotes the general's response, but here Marcellus' words differ entirely—a 'jesting' (σκώπτων) remark on the futility of fighting 'this geometrical Briareus' (17.1). This structural correspondence implies the existence of a prior historiographic template—or, at least, an established episode in one historical tradition—in which, at this point in the narrative sequence, Marcellus voices admiration of or exasperation at Archimedes' supernatural/technological powers. Tzetzes would thus have found another example of this model in an alternative source, which could have been Dio. More generally, the quotation in scholium 2.46a evokes a persistent face-saving motif of Roman historiography that credits initial reverses at Syracuse to the singular scientific genius of 'one old man' rather than collective Syracusan martial superiority.⁶¹ Tzetzes rehearses this Archimedean topos in other works, likewise employing the adjective γηρανδράριος, unique to Tzetzes' *œuvre* and possibly his own coinage. The presence of such 'Tzetzean' vocabulary in scholium 2.46a is unsurprising and need not exclude a classical antecedent, given the place of adaptive epideictic erudition in Tzetzes' artistry.⁶² Ultimately, nothing in its language or style requires that this specimen of direct speech derives from Dio (or any other ancient author). Yet, unless we infer that Tzetzes himself, perhaps loosely inspired by Plutarch, put these words into Marcellus' mouth, Dio remains the most likely source. The question must remain open.

Finally, the third section of scholium 2.46a, concerning the fall of Syracuse and Archimedes' death, although, overall, less noteworthy than the first section, evinces the same compositional history and pattern of intertextuality with the other indirect witnesses, while modestly augmenting our understanding of this lost passage in Dio's

⁵⁹ Examples in Rich (n. 58), 222–4, 229; Mallan (n. 29), 364.

⁶⁰ Zonar. 9.4 (2.263.5–10) = Cass. Dio 15 F57.35 (Boissevain 1.233.17–26).

⁶¹ Polyb. 8.3.3 (μία ψυχὴ), 7.7–9 (μία ψυχὴ, πρεσβύτην ἕνα Συρακοσίω); Livy 24.34.1 (*unus homo*); Plut. *Vit. Marc.* 17.1–2 (ψυχὴ μία); Sil. *Pun.* 14.338 (*calliditas Graia atque astus pollutior armis*). See Dijksterhuis (n. 7), 26–9; Jaeger (n. 7), 75–122.

⁶² Cf. Schol. *Ar. Nub.* 1024a (Holwerda 622.2) ἐνὸς ἀνθρωπαρίου γηρανδραρίου. *LBG* s.v. γηρανδράριον, citing only the latter instance, construes a neuter noun, 'altes Männchen'. In fact, the adjectival γηρανδράριος qualifies the noun ἀνθρωπάριον, 'one withered old little man'. I similarly construe Schol. *Carm. Il.* 2.46a (167.18) ἐν τι δαμιόντιον γηρανδράριον. Archimedes as ὁ γέπων: *Chil.* 2.35.118, 131, 147; 3.66.63; 4.505.

Roman History. Below, the text of the scholium is juxtaposed to that of Tzetzes' *Chiliades* (with corresponding wording marked in bold) and Zonaras' *Epitome* (correspondences underlined):

Tzetz. Schol. *Carm. Il.* 2.46a (168.6–18):

τελευτᾶ ὁ γέρον ὠδέ πως, ἀλούσης τῆς Συρακούσης ὑπὸ Μαρκέλλου ἢ παννυχιζόντων Συρακουσίων Ἀρτέμιδι ἢ προδεδομένης παρὰ τινων ἐπέστη τῷ γεωμέτρῃ Ῥωμαῖος ξιφῆρης μηχανικόν τι διάγραμμα γράφοντι καὶ καθεῖλκεν αὐτόν· ὁ δὲ ἀπόστηθι, ἄνθρωπε, τῆς γραμμῆς αὐτῷ ἔλεγεν. ὡς δ' ὁ Ῥωμαῖος ἐπέκειτο καὶ σφοδρότερος εἶλκεν αὐτόν, ὁ Ἀρχιμήδης στραφεῖς καὶ συνεῖς τὸ πραχθὲν ἔβόα· “δὲτω μοὶ τίς τι τῶν ἐμῶν μηχανῶν”. καὶ περιδεῆς γεγονῶς ὁ Ῥωμαῖος ἀνεῖλεν αὐτόν. ὁ δὲ βασιλεὺς Ῥωμαίων ὁ Μάρκελλος ἐθρήνησε τοῦτο ἀκηκόως καίπερ πολέμιος ὢν καὶ τὴν κόμην ἐσπάραξεν ἐπὶ τούτῳ καὶ πολεμῖοι πεφυκότι καὶ γέροντι καὶ μεγαλοπρεπῶς αὐτόν μετὰ πάντων Ῥωμαίων καὶ ἀρίστων Συρακουσίων ἐνεταφίασε, τὸν δὲ τοῦτου οἶμαι φονέα πελέκει κατέκρινεν.

Tzetz. *Chil.* 2.35.134–51:

οὗτος, κατὰ Διόδωρον, τῆς Συρακούσης ταύτης, προδότου πρὸς τὸν Μάρκελλον ἀθρόως γενομένης (135)

εἴτε, κατὰ τὸν Δίωνα, Ῥωμαῖοις πορθηθείσης, Ἀρτέμιδι τῶν πολιτῶν τότε παννυχιζόντων, τοιουτοτρόπως τέθηκεν ὑπὸ τινος Ῥωμαίου, ἦν κεκυφῶς διάγραμμα μηχανικόν τι γράφων, τίς δὲ Ῥωμαῖος ἐπιστᾶς εἶλκεν αἰχμαλωτίζων. (140)

ὁ δὲ τοῦ διαγράμματος ὅλος ὑπάρχων τότε, τίς ὁ καθέλκων οὐκ εἰδῶς, ἔλεγε πρὸς ἐκεῖνον· “ἀπόστηθι, ὦ ἄνθρωπε, τοῦ διαγράμματός μου”. ὡς δ' εἶλκε τοῦτον συστραφεῖς καὶ γνοὺς Ῥωμαῖον εἶναι, ἔβόα· “τί μηχανήμα τίς τῶν ἐμῶν μοι δότω”. (145)

ὁ δὲ Ῥωμαῖος πτοηθεὶς εὐθύς ἐκεῖνον κτείνει, ἄνδρα σαθρὸν καὶ γέροντα δαιμόνιον τοῖς ἔργοις. ἐθρήνησε δὲ Μάρκελλος τοῦτο μαθὼν εὐθέως, λαμπρῶς τε τοῦτον ἔκρυψε ἐν τάφοις τοῖς πατρώοις σὺν τοῖς ἀρίστοις πολιτῶν καὶ τοῖς Ῥωμαῖοις πάσι, τὸν δὲ φονέα τοῦ ἀνδρὸς οἶμαι πελέκει κτείνει. (150)

Zonaras, *Epit.* 9.5 (2.264.14–15, 264.27–265.2):

[ὁ Μάρκελλος] τηρήσας οὖν τοὺς Συρακουσίους παννυχίδα τῇ Ἀρτέμιδι ἄγοντας πανδημί, ... καὶ τῶν λοιπῶν τῆς Συρακούσης ἐκράτησεν. ἐγκρατεῖς δὲ τούτων οἱ Ῥωμαῖοι γενόμενοι ἄλλους τε πολλοὺς καὶ τὸν Ἀρχιμήδην ἀπέκτειναν. διάγραμμα γάρ τι διαγράφων, καὶ ἀκούσας τοῦ πολεμίου ἐφίστασθαι, “πῶρ κεφαλάν” ἔφη “καὶ μὴ παρὰ γραμμάν.” ἐπιστάντος δὲ αὐτῷ πολεμίου βραχὺ τε ἐφρόντισε καὶ εἰπὼν “ἀπόστηθι, ἄνθρωπε, ἀπὸ τῆς γραμμῆς” παρᾶξυνέ τε αὐτόν καὶ κατεκόπη.

Even if, despite a gap of possibly two decades, the wording and the content of Tzetzes' scholium are more closely aligned with *Chil.* 2.35 than with Zonaras' *Epitome*, this triple comparison again demonstrates that the scholium is an independent witness to Dio's text. Evidently, in both of Tzetzes' works—and explicitly in the *Chiliades*—he combined information drawn from Dio and Diodorus. Scholium 2.46a likewise reports variant accounts of the city's capture, ἢ παννυχιζόντων Συρακουσίων Ἀρτέμιδι ἢ προδεδομένης παρὰ τινων, ‘either while the Syracusans were celebrating an all-night festival of Artemis or because betrayed by certain people’, two versions that in *Chil.*

134–6 Tzetzes respectively assigns to Dio and Diodorus.⁶³ In contrast, as noted above, there is no evidence that Zonaras used Diodorus' *Bibliotheca* as a source for any part of his *Epitome*. Consequently, given significant differences between Tzetzes' and Zonaras' accounts of this episode, with each author providing details not mentioned by the other, Zonaras must be regarded as the more authoritative guide to Dio's text, while it may be presumed that divergent and additional content in Tzetzes' scholium and/or *Chiliades* is likely to derive from Diodorus. Conversely, and of greater interest for present purposes, where the wording of Tzetzes' scholium corresponds to Zonaras' text (but diverges from Tzetzes' *Chiliades*), that concurrence can only be explained by their collateral descent from Dio. This common-source relationship is most apparent in Archimedes' direct speech: Tzetzes' scholium (168.10) “ἀπόστηθι, ἄνθρωπε, τῆς γραμμῆς” and Zonar. 9.5 (2.265.1–2) “ἀπόστηθι, ἄνθρωπε, ἀπὸ τῆς γραμμῆς”, distinct from Tzetzes' *Chiliades* (2.35.143) “ἀπόστηθι, ὦ ἄνθρωπε, τοῦ διαγράμματός μου”.

In this context, however, the other neglected work under discussion, Tzetzes' *Hypomnema*, acquires unexpected textual significance. In its antepenultimate section, where St Lucia is condemned to be beheaded, Tzetzes places in her mouth an inspiring account of Archimedes' last moments, where she quotes his final words:⁶⁴

πάλιν τάδ' ἀνεφθέγγετο· Ἀρχιμήδης ἐκεῖνος ὁ πρόγονος ὁ ἐμὸς καὶ μέχρι τῆσδε τῆς τελευταίας ἀναπνοῆς μοι τὸν λόγον χαρίζεται. μηχανικὸν γάρ οἱ διάγραμμα γράφοντι, προδοσία τῆς Συρακοῦσης ἀλούσης ἐπιστάς τις Ῥωμαῖος πολέμιος εἶλκεν αὐτὸν τῆς χειρὸς ἐπικεκυφῶτα τῷ διαγράμματι· ὁ δὲ Συρακοῦσιών τινα εἶναι οἰόμενος “ἀπόστηθι”, ἔλεγεν, “ἄνθρωπε, τῆς γραμμῆς”. ὡς δ' “εἴπερ μὴ ἔπη, ἀφελῶ σου”, εἶπε, “τὴν κεφαλὴν”. Ἀρχιμήδης· “ἔλεῖς”, ἔφη, “ἄνθρωπε, τό, κλυθὶ ἐμοῦ, ἐγὼ δὲ τοι ἐξεροῦμαι, ναί, τὰς σοι, ὡς Ἀρχιμήδης, βέλτερον ἔντι παρὰ κεφαλάν εἶναι ἢ παρὰ γραμμάν”. κάμοι δὲ ... παρὰ κεφαλάν βέλτερον εἶναι ἢ παρὰ τὴν εἰς Θεὸν ἄγουσαν εὐθεῖαν γραμμῆν.

Again she spoke aloud as follows: ‘Archimedes, that forebear of mine, even up to my last breath has pleasing words for me. For as he was drawing a mechanical diagram, when Syracuse was captured by treachery, a certain Roman enemy, having come upon him, began dragging him off by the hand as he was bent over his diagram. He, supposing that it was some Syracusan, said, “Stand away, man, from my drawing”. Then [the Roman] said, “If indeed you do not follow me, I shall take off your head.” “Take it, man”, said Archimedes, “Hear me, I assuredly declare, yes, that thus, for Archimedes, it is better for you to be at my head than at my drawing”. And for me [St Lucia] too ... it is better at the head than at the line that leads straight to God.’

There are, unsurprisingly, obvious parallels, in language and substance, between this passage of Tzetzes' *Hypomnema* and both *Chil.* 2.35 and scholium 2.46a. In particular, Archimedes' reported exclamation “ἀπόστηθι, ἄνθρωπε, τῆς γραμμῆς” again coincides with the scholium and with Zonaras, against the wording in *Chil.* 2.35, reinforcing the authority of the—now three—prose witnesses over the metrically constrained diction of Tzetzes' verses. There are also omissions from the *Hypomnema* compared to Tzetzes' other two versions. However, the most striking feature is the inclusion of Archimedes' remark ‘βέλτερον ... παρὰ κεφαλάν εἶναι ἢ παρὰ γραμμάν’. This utterance, recorded with Doric orthography, finds no parallel in Tzetzes' *Chiliades* or in scholium 2.46a, but it does correspond, almost exactly, to Zonaras' Dio-derived account: ‘παρ κεφαλάν’ ἔφη ‘καὶ μὴ παρὰ γραμμάν’. Hitherto, Zonaras was the unique witness to this quotation. As there is no suspicion or likelihood that Tzetzes consulted this passage of Zonaras' *Epitome* when composing his *Hypomnema*, the only explanation for this

⁶³ See page 442 above for Tzetzes' conflation of two stages of the siege.

⁶⁴ *Hypomn.* 12.1–12.

phraseological coincidence is a common source. Here again, one of Tzetzes' three treatments of Archimedes at Syracuse transmits Dio-derived material not transmitted in the other two. In this case, although certainty about the precise setting of this quotation in Dio's text remains elusive, Tzetzes' *Hypomnema* appears, at least, to provide a narrative and oratorical context for Archimedes' words, whereas Zonaras' severe abridgement offers, at best, a disjointed skeletal outline of what was undoubtedly a more developed story in Dio's *Roman History*.

CONCLUSIONS

The current constitution of Dio's account of Archimedes' role in the siege of Syracuse in *Roman History* 15, depending on Zonaras' *Epit.* 9.4–5 and Tzetzes' *Chil.* 2.35, is essentially a product of nineteenth-century editorial knowledge and method. While subsequent studies have more clearly differentiated Tzetzes' use of three cited sources (Dio, Diodorus and Anthemius), the wider bibliography continues to harbour misconceptions and inconsistencies. This investigation has drawn attention to corresponding Dio-derived content in a scholium to Tzetzes' *Carmina Iliaca* (2.46a), his earliest engagement with Homeric verse (c.1133–1140), and in his *Hypomnema* (1154/1158), a hagiographical opusculum, contemporary with the composition of his *Chiliades* (mid/late 1150s). Comparative analysis of these two texts identifies fluctuating verbal correspondences with Zonaras' *Epitome* that have no parallels in *Chil.* 2.35. Correspondingly, each of the new witnesses contains details not found in the other and/or in the *Chiliades*. This shifting pattern of convergence and divergence shows that both the scholium and the *Hypomnema* are independent witnesses to Dio's *Roman History*, reflecting Tzetzes' selective exploitation of Dio's work in three distinct projects over two decades. If Tzetzes' scholia to his *Carmina Iliaca* are correctly dated fifteen to twenty years before his *Chiliades* and *Hypomnema*, this Homeric exegesis charts his first traceable encounter with Dio's work. The possibility that the scholia may also predate Zonaras' *Epitome*, if its dating to the 1140s is preferred, would make scholium 2.46a the earliest witness to this section of *Roman History* 15. Consequent advances in comprehending Dio's text relate primarily to language, but the foregoing investigation also sheds modest light on content. The ability of scholium 2.46a to confirm wording used by Zonaras specifically in connection with Archimedes' 'burning-mirror' substantiates the occurrence of this device in Dio's account, should such verification be needed, if only to counter lingering misapprehensions in some studies of ancient mathematics. Whatever Dio's source, his retention or insertion of this apparently recent legendary element, even if briefly mentioned, may have implications for understanding the historian and the sort of work he wished to write. The scholium also raises the possibility that this part of Book 15 contained direct discourse, in the form of a rhetorical interjection by Marcellus, though this inference cannot advance beyond conjecture. In addition, the *Hypomnema*, uniquely of Tzetzes' three texts, supplies corroborative evidence for a quotation of Archimedes that was previously known only from Zonaras (9.5).

Researchers must now take account of all three of Tzetzes' writings, whose collective and individual testimony, particularly where verified by concurrence with Zonaras' *Epitome*, affords a better prospect of arriving at Dio's original text via several collateral lines of textual tradition. Furthermore, it is clear that Tzetzes' scholium and/or

Hypomnema are sometimes more faithful witnesses, especially to Dio's wording, in part because the two prose texts are not constrained by metrical considerations that govern lexis and syntax in the *Chiliades*, and despite the scholium containing factual lapses attributable to youthful inattentiveness. This new editorial scenario poses complications beyond a novel arrangement and numbering of multiple 'fragments'. For example, future editors will be obliged to determine the significance of verbal correspondence between the scholium and the *Hypomnema* and/or the *Chiliades* even in the absence of parallels in Zonaras' text, itself a selective abridgement; in short, does shared vocabulary across Tzetzes' works, separated by fifteen to twenty years, go back to Dio or does it result from currently obscure intertextual links or from mere coincidence?⁶⁵ Similarly, lexical eccentricity in the scholium alone, relative to the rest of Tzetzes' *œuvre*, may also originate in Dio.⁶⁶ Ultimately, given the growth of interest in both authors, it is hoped that the increasingly nuanced enquiries into literary and textual aspects of Dio's *Roman History* will extend investigation to Tzetzes' lesser-known writings and a re-evaluation of their traits as sources for Dio-derived material. Certainly, scholars have not yet fully mined this seam of research.⁶⁷

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⁶⁵ Certain 'classical' words and phrases, atypical of Tzetzes' lexicon, occur in multiple witnesses, without parallels in Zonaras: e.g. Schol. *Carm. Il.* 2.46a (167.3–4) ὑποβρυχίους ἐποίη; *Hypomn.* 11.18–19 ὑποβρυχίους ποιῶν (cf. Cass. Dio 39.61.2 ὑποβρύχια). The adjective ὑποβρύχιος does not otherwise occur in Tzetzes' writings.

⁶⁶ For example, despite numerous occurrences of ξίφος and cognates across Tzetzes' works, the scholium contains the sole instance of ξιφῆρης. Four instances are documented in Dio's *Roman History*, preserved directly or in excerpta: 15 F57.28 = *EV* 33; 56.43.2; 78(77).15.3; 79(78).7.1. Among Roman historical writers ξιφῆρης occurs more frequently only in Plutarch and Josephus; no occurrence is found in Diodorus.

⁶⁷ For example, the immediately following Schol. *Carm. Il.* 2.48a Αἰνεάδαο (169.14–170.6) contains condensed material drawn from the fragmentary beginning of Dio's *Roman History* 1 F1–5 (Boissevain 1.2–7), as witnessed by Zonar. 7.1 (2.85.6–87.9) and by Tzetz. *In Lycophr. Alex.* 1232 (Scheer 2.352–5). Cf. Schol. 2.71a Αἰνεῖον ἀπάρταξε (172.6–11). Furthermore, Tzetzes cites Cassius Dio (Δίων Κοκκειανός) at Schol. 1.239e καὶ Λουκρητὴν τε (140.1–141.4 at 140.1–2) in a list of authors who wrote about Lucretia (cf. Cass. Dio 2 F11.13–19; Boissevain 1.32–4). Prior scholarship on Dio has overlooked this testimonium and fragment.